

CLAIMS

What is claimed is:

1. A new method of digital FM demodulator , comprising:
 - a. input the modulation signal to the delay lines with multiple output;
 - b. select one output signal from the multiple output delay lines;
 - c. compare the delayed signal phase with original modulation signal and accumulate each compared phase difference;
 - d. said accumulated phase difference is quantized into one or more bit digital signal;
 - e. generate another set of digital signal based on the above accumulated digital signal;
 - f. re-select output signal from the multiple output delay lines according to the signal generated in step-e;
 - g. repeat the phase comparison and accumulation in step-c and quantization in step-d, digital accumulation in step-e and re-select output signal from the multiple output delay lines in step-f, again the step-c,d,e,f;
 - h. After one cycle of step c-d-e-f, there is one set of digital signal pass to Integrator and filter out the quantized noise by way of a low-pass filter to get the original modulation signal.

2. A new method of digital FM demodulator as claimed in claim 1, wherein said phase difference could convert into voltage or current waveform for accumulation and quantization.
3. A new method of digital FM demodulator , comprising:
 - a. delay input modulation signal by digital controlled delay lines;
 - b. compare the delayed rising or falling edge of modulation signal with the original modulation signal by phase detector to generate the phase-leading or phase-lagging pulse signal;
 - c. convert the phase difference of said two pulse into voltage level and stored in capacitor, the voltage difference accumulated in capacitor is equal to the phase difference accumulation;
 - d. quantize the capacitor voltage into one or more bit digital signal;
 - e. integrate or accumulate the digital signal by digital integrator to generate another set of digital signal;
 - f. put the output signal of digital integrator into the digital controlled delay lines to control the delay time of delayed modulation signal;
 - g. do a cycle of step b,c,d,e to accumulate a digital signal will generate another set of digital signal which will filter out the high frequency quantized noise by a low-pass filter to get original modulation signal.
4. A new method of digital FM demodulator , comprising:
 - a. a digital controlled delay lines used to delay input modulation signal;

- b. a phase detector to generate phase-leading or phase-lagging signal based on the rising or falling edge of delayed modulation signal compared with original modulation signal;
- c. a capacitor store the accumulation voltage difference, said accumulated voltage is also the accumulation of the phase difference;
- d. a quantized one or more bit digital signal from capacitor voltage;
- e. a digital integrator to accumulate the said above digital signal to generate another set of digital signal;
- f. a output digital signal from said integrator to delay lines to control the delay time of delayed modulation signal;
- g. a quantizer which output signal been filter our by a low-pass filter to get the original modulation signal.

5. A new method of digital FM demodulator as claimed in claim 4, wherein said digital controlled delay lines comprising delay units, multiplexer, and decoder; each output of delay unit is relative to each input of multiplexer and the delay time of each delay unit is the same; the input digital signal after decoding could select the corresponding output signal of multiplexer; therefore, the delay time of digital controlled delay lines is determined by input digital signal.
6. A new method of digital FM demodulator as claimed in claim 4, wherein the quantizer and digital integrator need a trigger signal that could use input

modulation signal directly; said phase detector will compare the rising edge of input modulation signal and delayed modulation signal and using the falling edge to trigger said quantizer and integrator.

7. A new method of digital FM demodulator as claimed in claim 4, wherein the said quantizer could be one or more bit analog-to-digital converter and one bit quantizer is a voltage comparator.
8. A new method of digital FM demodulator as claimed in claim 4, wherein the said quantizer and integrator use same bit number and one bit integrator is a up-down counter.